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EPA GENERAL COMMENTS and ASTARIS RESPONSES

POND 17 CLOSURE PLAN

1. 40 C.F.R. § 265.228 (b)(2) requires the owner/operator of a surface impoundment which is to be closed as a landfill to maintain and monitor the leak detection system in accordance with 40 C.F.R. § 265.226(b). 40 C.F.R. § 265.226(b)(2) requires the company to record the amount of liquids removed from the leak detection sump weekly during phase I of the closure, and with reduced frequency after the final cover is installed depending on the amounts of liquids found in the sump. The Closure and Post-Closure Plan must be revised to include: 1) piping and system modifications for continued operation of the leak collection, detection, and removal system (LCDRS), 2) operating plans to monitor and remove liquids from the sumps and; 3) record keeping for the amount of liquid collected in the sumps.

Response: 1) Piping modifications are not needed as part of the pond closure and were not addressed in the closure plan as closure activities will not interfere with the LCDRS. The Pond 17 LCDRS is presently piped to an existing header pipe that routes water to Pond 18. However, discharge to Pond 18 will end no later than May 26, 2002 per the RCRA Consent Decree. The connection to the header pipe will be modified to convey any Pond 17 water after that cut-off date to a new on-site water treatment facility or to direct it to other RCRA-compliant management.

Section 7.2.1, page 7-27, second paragraph will be revised as follows: "The existing leak detection system will continue operating during closure and post-closure. The system will be maintained, inspected, and monitored per Appendix A Sections 9.0 and 10.0 of the RCRA Pond Management Plan (September 1998) and in accordance with 40 CFR § 265.226 & 265.228 265.222 **~~265.226(a) and § 265.226(b)~~. The LCDRS sump discharge piping will be disconnected from the current header pipe and rerouted to a pumping system prior to the pond closure dewatering activity. Any water in the system will be removed and sent directly, via the pumping system, to a new on-site water treatment facility or otherwise managed in accordance with RCRA requirements."**

2) For operating plans during closure, see the response to 1) above. For post-closure, water removed from the sump is addressed in Section 10.3, page 10-8, last sentence of the first paragraph, which states "Water removed from the leachate collection sump will be disposed of as described in Section 8.11.2". The following clarification will be made to the beginning of the paragraph in Section 10.3: "The LCDRS will be maintained and monitored per Appendix A of the RCRA Pond Management Plan (September 1998) and in accordance with 40 CFR § 265.226(~~b~~). The leak detection observation well/sump will also be inspected ~~quarterly during the post-closure period and within~~..." as required pursuant to 265.226 & 265.228 during the post closure period.

3) Record keeping is addressed in Section D.8.2 of the RCRA Part B Permit Application.

monitored weekly

See the responses to Specific Comment Nos. 3, 9, 13, 23 and 24 related to the LCDRS. Astaris has announced that phosphorus production will cease at the Pocatello facility in the near future. Both the closure plan and the responses presented in this document refer to procedures specified in other documents that address the operation, inspection, monitoring, and reporting requirements of the LCDRS during the closure and post-closure period. Astaris will be reviewing and revising, as appropriate, several of these documents (for example the RCRA Pond Management Plan (PMP), the RCRA Interim Status Inspection Plan, and the RCRA Part B Permit Application) to reflect the non-operational status of the facility. Astaris may consolidate or realign the documents in which record keeping procedures are described, but in no event will record keeping requirements for the Pond 17 LCDRS be reduced from those currently described in the closure plan and PMP and will continue to be in accordance with 40 CFR § 265.226(b).

2. The Pond 17 Closure Plan contains repeated statements concerning the similarity of waste in Pond 17 with waste in Ponds 8S and 15S where there has been no reported problems with phosphine gas during closure. These assertions may be correct, however, absence of adequate characterization data for the wastes in the ponds 8S, 15S, and 17 raises concern that the Pond 17 wastes may be similar to those in Pond 16S, where gas emission occurred in early 2001. The Closure Plan must be revised to include:

General Response: As discussed in Astaris's July 20, 2001 response to the EPA Request for Information dated June 19, 2001, Pond 16S was operated differently than the other ponds. Specifically, the first bullet item in Section 4.2 of that document reads "Pond 16S began operation in 1993. The initial material placed in the pond consisted of non-limed precipitator dust (including material dredged from Ponds 8E and 9E) and furnace/dock solids. During later operation, lime-treated precipitator slurry was periodically placed in the pond, some but not all of which met the NOSAP treatment criteria. Thus, there were likely layers of non-limed (lower layers) and limed material (upper layers) within Pond 16S. In contrast, the content of the other ponds is relatively homogeneous. For example, Pond 8E primarily contains only NOSAP precipitator solids, the Phase IV ponds primarily contain only phosphorus dock solids (not lime-treated), and 8S and 15S did not receive any lime-treated material." The July response further goes on to state that the method used to construct the center dike in Pond 16S significantly disturbed and mixed the various lime-treated and non-lime-treated materials and likely resulted in the hydrolysis and evolution of phosphine. This hypothesis is supported by the fact that the buildup of phosphine observed at the west end of the pond is where the construction process resulted in greater mixing of the waste layers. In contrast, only on-spec NOSAP, as defined in the RCRA Pond Management Plan (PMP), was placed in Pond 17 which contains comparatively low concentrations of elemental phosphorus (as demonstrated by the NOSAP Pilot testing data presented in Appendix H of the PMP). Since only on-spec NOSAP slurry was placed in Pond 17, there are no heterogeneous layers in the pond that could be mixed or disturbed during pond closure. Furthermore, as no center dike will be constructed at Pond 17, there will be no significant disturbance of pond solids during pond closure.

a) Results of analyses that have been conducted on the wastes in Pond 17, and a list of all hazardous constituents likely to be found.

Response: The results of NOSAP slurry sampling and analysis for elemental phosphorus conducted pursuant to the PMP are provided as Attachment 1 to this response document. Results of Tank V-3700 sampling conducted pursuant to the facility's waste analysis plan (WAP) are provided as Attachment 2.

b) Results of any separate analyses for pond solids and liquids (decant water) for Pond 17 wastes, including total phosphorus results and toxicity characteristic leaching procedure extract analyses results from solids samples.

Response: The results of Pond 17 decant water sampling conducted pursuant to the facility's WAP are provided as Attachment 3. The results of a Pond 17 decant water sampled and analyzed by Astaris are provided as Attachment 4.

c) An assessment of the representativeness of the above data.

Response: The sampling and analytical methods were established to provide representative samples and comparable results using EPA established analytical methods to the extent practicable. A review of the daily and weekly NOSAP slurry sample results for elemental phosphorus show a mean value of 137 ppm and a standard deviation of 171 ppm. The samples, collected and analyzed pursuant to the WAP, were compared to the waste characterization for the wastes placed in Pond 17 that is included in Section C.2.2 of the RCRA Part B Permit Application. The results of WAP samples are consistent with the waste characterization.

d) An evaluation of the waste chemistry and an assessment of the potential for closure of Pond 17 to result in generation, accumulation and ignition of phosphine gas. This evaluation must include a quantitative assessment of the long-term potential for generation of phosphine gas.

Response: This issue is addressed in Section 7.1.4. of the Pond 17 closure plan.

e) An assessment of the presence and the potential for future generation of hydrogen cyanide gas and other toxic gas releases from Pond 17.

Response: Future gas generation in general is discussed in Section 7.1.4. The potential source of hydrogen cyanide gas is from cyanide in the wastes within Pond 17 only to the extent that it has not yet escaped or reacted with the other constituents of the waste. Future generation of hydrogen cyanide from the capped wastes is unlikely as the lime-treated waste is highly alkali and hydrogen cyanide has a low generation potential at high pHs. Because the capped unit will essentially be a closed system, there is a very low potential that pH will decrease to the point where significant generation of additional hydrogen cyanide would be expected.

The Closure Plan must be revised to account for the above waste analyses and predicted waste behavior and describe in detail how the proposed closure will control, minimize, or eliminate the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to groundwater, surface water and the atmosphere.

Response: The Closure Plan was prepared to account for these requirements and considerations consistent with RCRA regulations. The elements of the closure design that protect the environment from the release of enclosed wastes are addressed in Sections 2.3.2, 6.1, 6.2.1, 7.1.4, 7.2, 7.6, 8.9, 10.5, and 10.8. Section 6.2.1 specifically states "Capping of Pond 17 will control infiltration of rain water into the waste (pond solids). This will minimize the potential for migration of constituents from pond solids into groundwater or subsoil. Waste migration into surface waters will also be prevented by capping, as it will minimize chances of contaminated precipitation runoff." A description of the LCDRS is included in Section 2.3.2 and its continued operation is addressed in Section 8.9. Gas generation and control (released into the atmosphere) is addressed in detail in Section 7.1.4. No revisions to the Closure Plan are necessary.

EPA SPECIFIC COMMENTS and ASTARIS RESPONSES

POND 17 CLOSURE PLAN

1. Page 1-1, Fourth Paragraph and Section 2.3.1, Page 2-5.

   These paragraphs state laboratory test information on the NOSAP slurry and observations from Pond 8E, have shown that NOSAP slurry does not smoke or burn when allowed to dry. The referenced laboratory data must be provided. Since the Closure Plan proposes to allow the water level to drop, which may allow the solids to oxidize, additional information must be provided demonstrating that the Closure Plan is protective of human health and the environment. Since phosphorus pentoxide smoke converts to phosphoric acid upon exposure to moisture, plans for minimizing emissions of both phosphorus pentoxide and phosphoric acid must be included in the Closure Plan. A method to monitor and measure phosphorus pentoxide and phosphoric acid must be included in the Closure Plan.

   Response: Astaris development of the NOSAP process included an evaluation of the elemental phosphorus threshold concentration at which materials smoked or burned. A copy of the laboratory procedures and results are contained in Attachment 5 to this response document. Since only on-specification NOSAP slurry was placed in Pond 17, there is a very low potential for burning or smoking from exposed NOSAP solids at Pond 17.

   Astaris has decided to retract the proposal to lower the water level in Pond 17 to expose the pond solids in order for the solids to develop a crust that may have aided in placement of the initial fill. References to lowering the water level and exposing the pond solids during closure will be deleted. Refer to responses to Specific Comment Nos. 5, 16 and 19 for revisions to Sections 6.1, 7.2.1, and 8.2.

   Having retracted the proposal to expose solids prior to initiating the initial fill procedures, the pond closure procedures will be consistent with other successfully completed closures and minimize the potential for oxidation of solids. A blanket of 6 to 12 inches of water will be maintained over the sludge in order to deploy the geofabric separating the pond sludge and initial fill. Therefore, at the start of closure and until the pond sludge is completely covered with adequate sand fill, the pond sludge will be covered by at least 6 to 12 inches of water.

   Because the pond solids will not be exposed, air monitoring beyond that which is already proposed in the Pond 17 Health and Safety Plan is not proposed. As a further point, Astaris is not aware of any existing equipment for the real time monitoring of phosphorus pentoxide in air.

2. Section 2.3-1, page 2-4, third paragraph.

   This paragraph should clarify that these samples were taken after the wastes were treated with lime in a slurry of 20 % solids. Since the waste was treated at the point samples were obtained, these samples were not representative of the waste at the point of generation.

Response: The samples evaluated were representative of the materials placed in Pond 17. The nature of the untreated material is not relevant to the nature of the wastes placed into Pond 17. The following sentence in the third paragraph will be revised as follows to clarify the sampling location and whether the sample was treated: "Prior to installation of lime treatment, all samples were taken from the pipeline at the furnace building prior to the precipitator slurry being transferred to surface impoundments." In addition the following sentence will be added to the end of the paragraph: "NOSAP samples taken from Tank V-3700 at the furnace building after lime treatment are representative of the wastes placed in Pond 17."

3. Section 2.3.2, page 2-5 Unit Description
The operational history for Pond 17 should include a description of the status of the Pond 17 bottom liner system i.e., if the primary liner is leaking or has leaked. The Closure Plan should include the dates any leaks were detected, leakage rates, and the total volumes pumped from the LCDRS sump.

Response: The following sentence will be added to the end of the last paragraph in Section 2.3.2: "The allowable leakage rate (ALR) for the pond, established in accordance with 40 CFR 265.222(a), is 1750 gallons/acre/day (gpapd)." The following sentences will be added to Section 2.3.3: "The pumping rate from the LCDRS sump has never exceeded the action level of 50% of the ALR, with an average rate for the year 2000 of 0.7 gpapd, and a total volume pumped from December, 1997 through October, 2001 of 9736 gallons. There is no evidence that the bottom liner has been breached."

4. Section 4.2, Page 4-3
Elemental phosphorus must be added to the list of constituents for groundwater monitoring.

Response: Elemental phosphorus is not an appropriate indicator parameter for leak detection groundwater monitoring at Pond 17. As reported in the RCRA Interim Status Groundwater Monitoring Assessment reports, elemental phosphorus has not been found at detectable levels in downgradient wells at Pond 8S during semi-annual groundwater monitoring from 1998 through 2000. Sampling and analyses performed to-date in 2001 confirm these results. There is no evidence that elemental phosphorus is migrating to groundwater from an unlined, identified leaking pond (8S) and thus is not a useful groundwater indicator parameter. Therefore, the use of elemental phosphorus as a groundwater monitoring parameter for leak detection at lined ponds, such as Pond 17, will not provide information useful in determining the status of the pond. No revisions to the Closure Plan are necessary.

5. Section 6.1, Page 6-1, second paragraph
This paragraph discusses the plan to remove free surface water at the start of closure activities to allow pond solids to stabilize prior to initial fill. Since lowering the water level may result in phosphorus pentoxide emissions and potential burning, the plan must include a method to measure and monitor for phosphorus pentoxide and phosphoric acid, an action

threshold and response actions, and actions which will be taken to prevent smoking or burning.

Response: See the response to Specific Comment No. 1. Water cover will be maintained over the Pond 17 solids until adequate fill is placed over the pond sludge. The third and fourth sentences of the second paragraph of Section 6.1 will be deleted and the fourth sentence will be revised to read as follows: "The closure activities to be conducted are described briefly below:"

In addition, the first four paragraphs of Section 8.2 will be replaced with the following two paragraphs:

"Waste in Pond 17 consists of only on-spec NOSAP slurry pond solids, which will remain, and water, which will be removed during initial backfilling and pond solids consolidation. At the time of closure, the depth of the water in the pond is expected to be approximately 12 inches, occupying approximately 5.7 acre-feet of the pond capacity. Based on experience gained at the other ponds at the Astaris facility that have received initial backfill, an estimated 18.0 acre-feet of water will be squeezed from the sludge during the construction of the initial fill. Additional sludge consolidation anticipated prior to the placement of the final cap will generate a further 5.2 acre-feet of water."

"Water will be pumped out of the pond using dewatering pumps after sufficient sand fill is placed over the pond solids (6 inches or more in thickness). A PVC pipe water level marker will be driven into pond sludge near the shoreline of Pond 17 prior to the start of the initial sand fill. This water level marker will be used to monitor water levels during the early stages of the sand fill. All surface water will be removed using portable pumps. Additional dewatering using the dewatering system described in Section 7.4.6 will occur at the unit during the closure period, when the initial fill is placed, and will continue until settlement of the initial fill has diminished to acceptable levels. During the initial fill, water will be removed from the pond using portable pumps connected to the installed dewatering system which pumps from the 2-inch pipes inserted into the 6-inch perforated drain lines. Later, dewatering will be performed using dedicated temporary pumps."

The above planned revision to Section 8.2 also reflects changes made in response to Specific Comment Nos. 6 and 19.

6. <u>Section 6.1, second bullet:</u>
This paragraph states water pumped from the pond will be sent directly to the land disposal restriction (LDR) treatment plant or otherwise managed in accordance with RCRA regulations. The plan must estimate (including the basis/support for the estimate) quantities of water which will be generated from the pond closure over the dewatering period, the specific use of the water at the LDR plant (since the LDR plant processes wastes not water), and be more specific regarding how the company will otherwise manage the water in accordance with RCRA since the water may be considered a reactive hazardous waste.

Response: The LDR treatment plant will no longer be available to process water from Pond 17. Water removed from the pond during closure activities will be routed to a new on-site water treatment facility or an off-site facility and in either case will be managed in accordance with RCRA requirements. The last sentence of the second bullet in Section 6.1 will be modified to read as follows: "Water pumped from the pond during the backfill process will be sent to a new on-site water treatment facility or otherwise managed in accordance with RCRA requirements."

In addition, the second sentence in the second paragraph on page 1-2 will be revised to read as follows: "Any hazardous liquid wastes will be sent to a new on-site water treatment facility or otherwise managed in accordance with RCRA requirements."

The ninth bullet in Section 6.1 will be revised to read as follows: "Remove additional water using the temporary dewatering system and pump water from the drainage system directly to a new on-site water treatment facility or otherwise manage the water in accordance with RCRA requirements."

The last sentence of the third paragraph in Section 7.2.1 will be revised to read as follows: "After free surface water is removed, perforated drain pipes, installed on top of the geofabric filter above the sludge, will be utilized. Pipes inserted into these perforated drain pipes will initially be connected to portable vacuum pumps, and later connected to the temporary vacuum pumps, after their installation at the perimeter dike areas, to remove subsequent water accumulation directly to a new on-site water treatment facility or otherwise manage the water in accordance with RCRA requirements."

The last sentence of the fifth paragraph in Section 7.2.1 will be revised to read as follows: "Any water in the system will be removed and sent directly to a new on-site water treatment facility or otherwise managed in accordance with RCRA regulations."

The last paragraph of Section 8.2 will be revised to read as follows: "The water pumped out of Pond 17 will be sent to a new on-site water treatment facility or otherwise managed in accordance with RCRA requirements."

The second sentence of Section 8.11.2 will be changed to read as follows: "Any hazardous liquid wastes will be sent to a new on-site water treatment facility, or otherwise managed in accordance with RCRA requirements."

The quantities of water that will be generated during closure are addressed in the revised paragraphs for Section 8.2 that were presented in the response to Specific Comment No. 5.

7. Section 6, Page 6-2, ninth bullet.
This bullet should include installation of temperature and pressure monitoring equipment.

Response: The eleventh bullet of Section 6.1 will be revised to read as follows: "Mobilize the contractor, remove and dispose of the temporary cover, regrade the

subgrade, place the final cover, install settlement monuments, install temperature and pressure monitoring equipment, certify closure as discussed in Section 8.12, and demobilize the contractor."

8. <u>Section 6.6, Page 6-7,last paragraph</u>
   This paragraph must include the number of days Astaris will notify EPA in advance of initiating closure work.

   Response: The last sentence of Section 6.6 will be revised to read as follows: "Therefore, Astaris will review the schedule to finalize the specific calendar days for the closure activities, notify EPA at least 60 days prior to beginning closure, and proceed with the closure as planned."

9. <u>Section 6.6.1, Page 6-7</u>
   This paragraph states Astaris will continue to monitor the leak detection system for the surface impoundment. Results of this monitoring activity must be recorded in the operating record and reported annually.

   Response: Monitoring results recording and reporting for the Pond 17 LCDRS are addressed in Section D.8.2.6 of the RCRA Part B Permit Application.

   The monitoring and inspection activities during closure and post-closure become part of the operating record. Astaris is not aware of a specific regulation or requirement for routine annual reporting of LCDRS monitoring activity during closure and post-closure. Prior to closure, if the ALR is exceeded, Astaris will initiate the appropriate response as specified in the Response Action Plan.

   The following sentence will be added to Sections 6.6.1 and 10.3: "The results of inspections, monitoring activities, and water quantities related to the LCDRS during closure and post-closure are maintained at the facility."

10. <u>Section 6.6, Page 6-8, Table 6-1</u>
    The schedule must be revised to describe in detail the activity of removing the bird netting and support structure.

    Response: The netting and its support structure are a single system that is anticipated to take three to four weeks to remove. The actual duration and sequencing of the work will be determined by the contractor who will perform the work. Therefore, no more detailed schedule for this activity will be available until after EPA approves the initial fill phase of closure and Astaris completes a contract for the work.

    The following paragraph will be added to the end of Section 2.3.2: "Nylon netting was placed over the pond to prevent birds from landing on the water. The nylon net is supported by and tied to a grid of steel cables spaced at four-foot intervals. The steel cables are tied to a 36-inch diameter pipe which is set on the pond dike and extends completely around the pond, with the longitudinal cables being supported in the middle

by a suspended cable-support system. The 36-inch pipe is secured to deadman anchors located outside of the pond area to resist the tensile forces in the cables that support the bird netting. The bird netting is overlain in turn by a second set of steel cables that run only in the short direction and provide further restraint to the nylon netting."

The sub-section entitled "Bird Netting Removal" in Section 8.6.2.2 will be revised to read as follows: "Bird Netting Removal. To provide access to the pond area for backfilling, the bird netting system will be removed, decontaminated if necessary, and disposed of appropriately. The bottom steel cable grid will support the removal of the upper steel cables and the bird netting and will prevent them from coming in contact with the waste. Similarly, the lateral cables of the bottom cable grid are supported on the longitudinal cables and can also be removed without contacting the waste. However, the longitudinal cables are threaded through and supported in the middle by the suspended cable system, and it may be difficult to safely prevent them and the suspension cable from dropping into the pond sludge during the removal process. These cables are basically wire ropes and it may be difficult to remove wastes that become entrapped within the spaces between the individual steel strands of the cables. Therefore, any components of the bird netting system that cannot safely be removed and/or decontaminated will be left within the area enclosed by the pond dikes and within the pond sludge. All other components of the bird netting will be disposed of according to applicable RCRA requirements as described in Section 8.11.3."

11. Section 7.1.4, Page 7-10
This section of the Closure Plan suggests that phosphine gas problems in Pond 16S are "potentially attributable to the phosphine released during sludge intrusive activities of the center dike construction...." The problems in Pond 16S, however, could also be reasonably attributed to desaturation of the pond solids at the edge of the pond as a result of differential settlement and consequent exposure of the pond solids to air. The potential for this event occurring at Pond 17 must be addressed in the Closure Plan.

Response: Desaturation of pond solids is not considered to be a significant contributor to the generation of gas at Pond 16S, even considering possible differential settlement. Differential settlement at Pond 16S was no greater than at other ponds and the physical configuration of both the initial fill and the final cap severely inhibit the possibility of both the sludge drying and oxygen reaching the sludge.

The initial sand fill at Pond 16S was placed in very uniform layers with the Rotec Super Span equipment. Experience gained the previous year allowed the placement technique to be refined to the point where no mud waves were observed during sand placement. To control the possibility of sludge being squeezed up the faces of the dikes under the fabric, the level of the sand at the edges of the pond was kept above the level of the sand in the remainder of the pond. There was no evidence of sludge being squeezed above the original sludge level by the weight of the fill at any location in the pond. In addition, Pond 16S settlement measurements indicated the pond sludge settled in a more or less uniform manner.

Once the initial sand fill was in place, the dewatering of the fill was accomplished using the dewatering piping placed on top of the geofabric. The water is pumped from the 2-inch diameter insert pipe by pumps located on the pond's perimeter dikes. Once the water level is lowered to the point where air starts entering the 2-inch pipes, automatic controls shut off the pump. Hence, the dewatering system is incapable of lowering the water within the sand fill to lower than several inches above the geofabric. Even if there are irregularities in the surface of the sludge, such that some sludge high-points are above the water level, capillary forces within the fine grained sludge and wicking within the overlying geofabric will keep the sludge in an essentially saturated state.

After the placement of the temporary HDPE liner over the initial fill, the pond solids and the initial fill were completely enclosed by one or more impermeable layers with the exception of the space between the anchor trenches of the temporary liner and the pond lining system. This more or less closed system would have severely restricted the entry of air. It is reasonable to assume that any air originally trapped within the initial fill was essentially saturated with moisture at the time the HDPE liner was placed due to the presence of water within the fill. The presence of water within the fill would also cause any air entering the fill to replace the water withdrawn by the extraction system to quickly become saturated. Saturated air is not capable of drying the sludge. Further, the fabric over the sludge is covered by three or more feet of sand. Air circulation within the sand is very restricted due to the small sizes of the pores between the sand particles and the lack of pressure differentials. These factors combine to make it unlikely that the air within the fill could dry the geofabric and the underlying sludge faster than capillary forces and wicking action could re-wet them, hence making it extremely unlikely that any air could come into contact with dry sludge.

Even if some portion of the sludge were to become dry, it would still be covered by several feet of sand. As described in Sections 8.2 and 8.6.2.2 of the Pond 16S Closure Plan and as experienced working with pond sludge at the site, 6 inches of sand cover has been shown to be adequate to prevent the sludge from oxidizing.

As the above discussion demonstrates, oxidizing of the pond sludge caused by differential settlement is extremely unlikely. This fact is supported by observations at other ponds that have been initially backfilled since gases have not been detected at these ponds. Observations at Pond 15S in particular are relevant as the initial fill at Pond 15S was constructed in a similar fashion to that of Pond 16S. In both cases, the perimeter dikes were raised to provide added freeboard, center dikes were constructed, and both were backfilled using similar if not identical procedures and methods. Observed and measured settlement readings at both ponds indicated similar sludge consolidation characteristics. However, Pond 15S did not contain lime-treated solids (thereby limiting the potential for mixing lime and non-lime treated solids) and no gas generation was observed at Pond 15S, unlike that which occurred near the Pond 16S west dike area where lime and non-lime treated materials were mixed or disturbed.

The potential for gas generation in the sludge is discussed in considerable detail in Section 7.1.4 of the Closure Plan. If gas generation should occur at Pond 17, the

contingent gas collection system discussed in Section 8.6.2.2 will be adequate to collect and treat the gas generated. Hence, no changes to the Closure Plan are necessary. See the response to Specific Comment No. 17 for a further discussion regarding differential settlement, Specific Comment No. 13 for desaturation under the final cap, and General Comment No. 2 for a further discussion on gas generation at Pond 16S.

12. Section 7.1.4, Page 7-10

This section notes that contingent temporary gas collection piping will be installed under the temporary cover on Pond 17, in case gas buildup occurs as it did at Pond 16S. The Closure Plan must describe how this contingent system will be installed to prevent the pond solids from being exposed to air if the gas extraction system is operated.

Response: As described in Section 7.1.4.1, page 7-19, "A temporary system, similar in function, will be installed under the temporary cover to collect potential gas buildup during initial fill consolidation. The system is shown in Figure 7-3. The operations and maintenance of the monitoring systems are discussed in Attachment 10-2a, Section 2.5 and Attachment 10-2b, Section 4". Similar to the pressure monitoring system piping, the piping for the contingent system as described in the closure plan will be installed in the 6-inch thick liner foundation sand layer directly underneath the temporary cover. The piping and the sludge will be separated by at least 5 or more feet of sand and slag (initial fill), which, as stated in response to Specific Comment No. 11, will be more than adequate to prevent oxidation of the sludge. Furthermore, the proximity of the piping system to the edges of the fill will ensure that any air being drawn into the fill will be preferentially drawn into the gas collection piping rather than displacing the saturated air within the sand fill. No revisions to the Closure Plan are necessary.

start

13. Section 7.1.4, Page 7-12

The Closure Plan provides no information on the current status of the primary liner. If the primary liner in Pond 17 is currently not leaking, it is still reasonable to expect that minor breaks in the liner already exist or will develop during the post-closure period. If gases are generated in or volatilize from the wastes, they may migrate into the leak detection system (between the primary and secondary liners) and into the LCDRS sumps. Due to the potential for migration of gas outside the limits of the temporary and final cover, the Closure Plan a must be revised to include gas monitoring outside the cap limits. Monitoring must include ambient monitoring at a downwind location and gas sampling in the LCDRS sump manhole during each inspection.

Response: At this time, the LCDRS monitoring does not indicate that there are any significant leaks in the primary pond liner. As the pond is nearly full of sludge and water, any minor breaks within the liner would likely be below the water surface and water would be passing through any breaks rather than gas. The proposed placement method for the initial fill is very unlikely to damage the liner. Hence, the likelihood for the development of new breaks in the liner is very low. Gases would be most likely to enter the LCDRS system in a dissolved state within any small amount of pond water that may enter the system from the pond. Additional gas could be generated by oxidation of any constituents within the water when the water is exposed to air within

the LCDRS. In either case, the quantities involved are predicted to be very low based on experience to date. The personal gas detection meters used by the personnel that perform the LCDRS sump monitoring have not detected any measurable quantities of gas. Migration of gas through the secondary liner would, for the same reasons discussed above for the primary liner, be at a very low rate. Any gas that eventually migrated to the surface outside the cap limits would be at undetectable concentrations downwind from the pond. No revisions to the Closure Plan are necessary.

14. Section 7.4.6, Page 7-41

The Closure Plan must include the expected spacing and number of wick drains. Additional details must be provided on how the bottom liner will be protected from punctures during installation of wick drains.

Response: As stated in Section 7.4.6, wicks drains will be installed on a 7-foot center-to-center spacing. The existing bottom liner system is covered with one foot of native silt overlain by a 3-foot minimum thickness of select pit run slag (Figure 2-3). The planned depth of installation of wick drains in the field is 2 feet above the design elevation of the top of this slag. In addition, the wick drain layout will not encroach closer than 10 feet from the base of interior slopes within the pond perimeter to eliminate the need to vary wick drain depths to account for the sloping sides of the dike embankment. The equipment that will be used to install the wicks is monitored during installation to ensure the wicks do not penetrate beyond the depth specified. Therefore, the liner would not be punctured during wick drain installation. Section 8.6.2.2, page 8-10, second paragraph under "Wick Drains" will be clarified as follows: "The wick drains will be installed through the sand fill, geoweb, fabric, and pond sludge, and will terminate approximately 2 feet above the pond bottom, which is at least 6 feet above the primary liner. In addition, the wick drains will be installed no closer than 10 feet from the base of the interior dike embankment slopes to prevent penetration through the existing bottom lining system."

15. Section 7.4.8. Pate 7-42

The Closure Plan must address the fate of the capped waste in the event the solids completely dewater after the final cap is in place.

Response: As described in Section 7.1.4, page 7-10, second and third paragraphs, the sludge will remain nearly saturated. A discussion on the potential for desaturation of the sludge is included in the response to Specific Comment No. 11. In the unlikely event some of the sludge does dry, the drying process would be slow and only small quantities would be potentially exposed to oxygen at any one time. Furthermore, as stated in response to Specific Comment No. 11, covering pond solids with at least 6-inch of sand or soil prevents any rapid oxidation of pond solids. The pond solids will at least be covered by 5 feet of sand fill (not to mention the balance of the final cover) which will substantially reduce the potential for gas generation by oxidation. The above two factors would result in a maximum potential gas generation rate that was designed to be handled by the proposed pressure monitoring system and the contingent gas collection

and treatment system discussed in Sections 7.1.4.1 and 7.1.4.2. No revisions to the Closure Plan are necessary.

16. Section 7.2.1, Page 7-24

The section states that free surface water will be removed 2 months before the start of initial fill however, in order to deploy the geofabric, it may be necessary to pump water into the pond to a depth of 1 foot. Further justification for the initial dewatering must be provided since the initial removal of water 2 months before the start of fill could result in releases of phosphorus pentoxide or burning and appears to be unnecessary.

Response: See the response to Specific Comment No. 1. Water coverage over the wastes will be maintained until adequate fill is placed over the pond sludge. The first sentence of the first paragraph of Section 7.2.1 will be deleted.

17. Section 7.4.4 and 7.4.8, Page 7-42

The potential for differential settlement during the initial and final filling are not addressed in the Closure Plan. The Closure Plan must include a proposal for monitoring and addressing differential settlement during initial and final fill.

Response: Settlement monitoring for the period between the placement of the initial fill and the construction of the final cap is addressed in Section 7.4.7. The purpose of settlement monitoring during this period is to determine when the settlement rate has slowed sufficiently to allow for the construction of the final cap. While information on differential settlement can be obtained from the settlement data that will be collected, differential settlement that occurs prior to installing the final cap is not relevant to the performance of the final cap as the entire surface will be regraded prior to construction of the final cap.

Settlement monitoring after the construction of the final cap is addressed in Section 7.4.9. Section 7.4.8 addresses the potential for differential settlement due to placement of the final cap. Differential settlement will not be directly monitored during this period beyond visual observations made during routine inspections.

The function of the initial fill is to pre-consolidate the pond solids such that the anticipated large and irregular settlement will occur prior to the construction of the final cap. This is to ensure that no significant differential settlement will occur after the final cap is installed, thereby minimizing the impact of differential settlement on the final cap components as well as minimizing surface irregularities and ponding. Settlement (differential or otherwise) that occurs during the placement of the initial fill has no impact on the performance of the final cap and is only relevant to construction operations and the determination of the amount of materials placed for contractual purposes.

Estimated settlement after installation of the final cap is less than one foot, which is considered in the final cap design. The potential magnitude and impact of differential settlement on the final cap is addressed in Section 7.4.8. As stated therein, settlement of

the final cap is not expected to have any significant detrimental effect on the elements of the final cap.

The Closure Plan as written includes adequate settlement monitoring and need not be revised.

18. Section 8.1, Page 8-1
Additional details must be provided on the removal of bird netting including but not limited to: the plan for removal, location of disposal, and schedule for deconstruction of the net.

Response: See the response to Specific Comment No. 10.

19. Section 8.2, Page 8-3
This section must include a plan to monitor phosphorus pentoxide, phosphoric acid, hydrogen cyanide and phosphine emissions during the water removal and water addition during phase 1.

Response: See the response to Specific Comment No. 1. Water cover over the sludge will be maintained until adequate fill is placed over the pond sludge. Section 8.2 will be revised as presented in the response to Specific Comment No. 5.

20. Section 8.6.2.2, Page 8-9
Additional detail must be provided on the proposal to dispose of the bird netting inside Pond 17. A detailed plan for safely handling the net removal to minimize the potential for disposal of the net in Pond 17 must be provided. In addition, a contingent plan for safe decontamination and disposal in case the netting becomes contaminated with elemental phosphorus waste must be developed. Disposal of any of the bird netting system in the pond is acceptable only if there is no other workable alternative.

Response: See the response to Specific Comment No. 10.

21. Section 8.6.2.2, Page 8-9
If the FTIR units are removed due to the need to locate construction equipment, they must be relocated near the unit to continue collecting emission data in a manner consistent with the objectives of the Pond Management Plan. Plans for continued monitoring and responses, if thresholds are exceeded must be included.

Response: The FT-IR system will be left in place as long as the equipment does not interfere with the safe performance of the initial fill work. It is anticipated that the FT-IR system may be safely left in place during the removal of the bird netting, although the beam paths will intermittently be interrupted by activities associated with the dismantling of the bird netting, which will decrease the on-stream time of the monitoring operations. These interferences and disruptions will primarily be experienced during the daylight hours of the construction work days. Each work crew performing work in the pond area will have a personal phosphine monitor and work rules for all pond closure activities will be in full conformance to the requirements of the Plant Worker Safety Procedure as outlined in the RCRA Pond Management Plan

and the Task-Specific Health and Safety Plan for Pond 17 (Appendix E). The personal phosphine monitor(s) have been and will continue to be a far more effective method for monitoring personnel exposures and taking appropriate action to minimize worker exposures.

However, the locations of the transmitters are such that they will interfere with the safe deployment of the geofabric. Hence, they will need to be removed prior to the deployment of the geofabric at the latest. There is not sufficient space on the pond dikes to relocate them such that the fabric can be safely deployed. No revisions to the Closure Plan are necessary.

22. Section 8.6.2.2, Page 8-10

Additional detail regarding the installation and potential operation of the perforated PVC piping installed in the sand bedding layer to collect gas that may be generated during the initial closure phase must be provided.

Response: The paragraph for "Perforated PVC Piping and Sand Bedding" in Section 8.6.2.2 will be modified to read as follows: "As the initial sand and slag fill will be covered with a temporary impermeable geomembrane, a contingent system of perforated PVC piping, described in Section 7.1.4.1, will be installed beneath the geomembrane to collect any potential gas build-up underneath the temporary cover. This piping system will penetrate the temporary cover and, if necessary, be connected to a gas treatment system as described in Section 7.1.4.2 should phosphine build up underneath the temporary cover. Gases would be evacuated from the outlet of the contingent gas collection system and routed to the treatment unit by one or more blowers."

23. Section 10, page 10-1

The plan states that the facility will comply with 40 CFR 265.228(b)(2). This regulation requires maintenance and monitoring of the leak detection system and recording of the amount of liquids removed from the leak detection sump at least once each week during the active life and closure period, (this may be reduced to monthly and in some cases quarterly or semi-annually after the final cover is installed). 40 C.F.R. §§ 265.226(b)(1) and 265.221(a) specifically require leak detection system inspection and recording of liquids removed, and collection and removal of pumpable liquids in the sump. The Closure Plan must be revised to provide for weekly inspection of the leak detection sump, and recording of the amounts of liquids removed during the closure period and after the closure period, in accordance with the applicable regulations.

Response: See the responses to Specific Comment Nos. 9 and 24.

The Closure Plan does not include modifications to the piping from the leak detection ("LCDRS") sump to include standpipes, valve boxes or other arrangements where liquids removed from the sumps can be transferred to containers (e.g., tank trucks) or routed by pipeline to another treatment, storage or disposal unit. The Closure Plan must be revised to include modifications to the leak detection sump discharge piping and pump control system to allow collection and removal of pumpable liquids from the sump during and after closure.

Response: See the response to General Comment No. 1.

The Plan must be modified to provide for monthly inspections of the leak detection sumps for liquids as required by 40 CFR 265.226(b). In addition, the leak detection system inspection description (page 10-8) does not include the requirement to remove pumpable liquids from the sumps and record the amounts of liquids removed. The Inspection Record Form must be revised to include recording the amount of liquid removed. In addition, the Closure Plan does not mention inspection or removal of liquids from the leak detection sump during closure. Revise the Post-closure Plan Inspection Record Form and Activity Checklists to provide for initial monthly inspections of the leak detection sump for liquids, with potential reduced frequencies as provided in 265.226(b)(2). (A separate record form for leak detection system inspections is recommended, with spaces for recording the amounts removed.) Revise the leak detection inspection description to include removal, of pumpable liquids and recording of the amounts of liquids removed from each sump.

Response: See the responses to Specific Comments No. 9 and No. 24. In addition, the last sentence of the first paragraph on page 10-8 will be revised as follows: "Water will be removed from the leachate collection sump and disposed of as described in Section 8.11.2."

The Closure and Post-Closure Plans do not mention the pump operating level in the leak detection (LCDRS) sump. This elevation or depth is the level at which the pump operating switch must be set to prevent backup of liquids in the impoundment drainage layer and to minimize head in the sump. The pump operating level is the benchmark against which liquid levels must be measured to comply with 40 CFR 265.226(b)(2). Revise the Closure and Post-Closure Plans to define the pump operating level in the leak detection sump, and provide for measuring of liquid in the leak detection sump in relation to the pump operating level during every inspection of the sump.

Response: See the responses to General Comment #1 and Specific Comments #3 and #13.

24. <u>Section 10 Action Leakage Rate</u>

The Post-Closure Plans do not include determination of the average daily flow rate, and comparison with the action leakage rate, as required by 40 C.F.R. §265.222(c). The average daily flow rate must be calculated weekly during the active life and closure period, and monthly or less frequently, in accordance with 40 CFR 265.226(b), during the post-closure period.

Revise the Closure and Post-Closure Plans to provide for calculation of the average daily flow rate, and comparison with the action leakage rate and to include a revised response action plan that complies with 40 C.F.R.§ 265.223.

Response: The RCRA Pond Management Plan contains the response action plan and copies of the forms used to record and calculate the average daily flow rate. As stated therein, the LDCRS is inspected and the average daily flow rate is calculated weekly. Similar information is also contained within the RCRA Interim Status Inspection Plan and the Part B Permit Application.

A new sentence will be added to Section 10.3 as follows: "The Interim Status inspections, calculations, and Response Action Plans as defined in the Pond Management Plan (September 1998) will be continued during closure and post-closure to comply with 40 C.F.R. §265.222(c) and 40 C.F.R.§ 265.223, Response Actions."

The third paragraph in Section 10.3, page 10-8, will be revised to read as follows: "The leak detection observation well/sump will be inspected quarterly and within 48-hours after each 25-year storm event. The results of inspections, monitoring activities, and water quantities related to the LCDRS during closure and post-closure are maintained in the operating record. Water will be removed from the leachate collection sump and disposed of as described in Section 8.11.2. The Interim Status inspections calculations, and Response Action Plans will be continued during closure and post-closure to comply with 40 C.F.R. §265.222(c) and 40 C.F.R.§ 265.223, Response Actions."

25. Section 10.8, page 10-10
The Post-Closure Plan proposes an action level of 27 inches of mercury as the alarm level and (if confirmed) the criterion for conducting gas sampling. The Plan must be revised to explain how this action level was selected. Records of the typical seasonal ranges and average of ambient barometric pressure in the vicinity of the facility must be provided to support this action level.

Response: The basis for the selection of 27 inches as the action level is addressed in the seventh paragraph of the "Pressure Monitoring (Gas Collection) System" of Section 7.1.4.1. No revisions to the Closure Plan are necessary.

Attachments:

1. Analytical Results for NOSAP Samples Collected From October 15, 1998 to October 10, 2001

2. Summary of Tank V-3700 WAP Sampling Results

3. Summary of Pond 17 Decant WAP Sampling Results

4. Summary of Pond 17 Decant Non-WAP Sampling Results

5. Smoke Generation Test

Attachment 1.
Analytical Results for NOSAP Samples
Collected From October 15, 1998 to October 10, 2001

Sample Date	P4 ppm
10/15/98 A	120
10/15/98 B	128
10/16/98 A	219
10/16/98 B	144
10/18/98 A	129
10/18/98 B	193
10/19/98 A	216
10/19/98 B	215
10/20/98 A	269
10/20/98 B	235
10/21/98 A	304
10/21/98 B	347
10/22/98 A	356
10/22/98 B	374
10/23/98 A	201
10/23/98 B	180
10/27/98 A	187
10/27/98 B	192
10/28/98 A	73
10/28/98 B	71
10/29/98 A	90
10/29/98 B	107
10/30/98 A	100
10/30/98 B	110
11/1/98 A	68
11/1/98 B	63
11/3/98 A	68
11/3/98 B	76
11/7/98 A	139
11/7/98 B	181
11/8/98 A	111
11/8/98 B	123
11/9/98 A	88
11/9/98 B	95
11/12/98 A	289
11/12/98 B	250
11/13/98 A	303
11/13/98 B	310
11/14/98 A	320
11/14/98 B	316
11/15/98 A	185
11/15/98 B	163

Sample Date	P4 ppm
11/16/98 A	254
11/16/98 B	240
11/17/98 A	220
11/17/98 B	221
11/18/98A	161
11/18/98B	178
11/19/98A	257
11/19/98B	262
11/20/98A	268
11/20/98B	267
11/25/98A	977
11/25/98B	931
11/26/98A	203
11/26/98B	193
11/27/98A	127
11/27/98B	129
1/1/99A	319
1/1/99B	315
1/4/99A	130
1/4/99B	127
01/29/99	93
01/31/99	41
02/03/99	41
02/04/99	114
02/05/99	70
02/06/99	96
02/07/99	122
02/08/99	95
02/09/99	80
02/10/99	59
02/11/99	384
02/12/99	550
02/14/99	231
02/17/99	171
02/18/98	39
02/19/99	175
02/20/99	107
02/21/99	186
02/22/99	289
02/23/99	85
02/23/99	63
02/24/99	234

Sample Date	P4 ppm
02/25/99	269
02/26/99	1107
02/27/99	149
02/28/99	126
3/2/99A	271
3/2/99B	272
3/3/99A	99
3/3/99B	79
3/5/99A	67
3/5/99B	76
3/6/99A	57
3/6/99B	55
3/7/99A	93
3/7/99B	88
3/8/99A	50
3/8/99B	50
03/09/99	245
03/10/99	171
3/15/99A	135
3/15/99B	113
3/16/99A	216
3/16/99B	217
3/17/99A	144
3/17/99B	150
3/18/99A	167
3/18/99B	139
3/20/99A	199
3/20/99B	245
3/21/99A	176
3/21/99B	126
3/23/99A	631
3/23/99B	668
3/25/99A	172
3/25/99B	173
3/31/99A	55
3/31/99B	84
4/1/99A	132
4/1/99B	119
4/2/99A	119
4/2/99B	93
4/3/99A	39
4/3/99B	36

Attachment 1.
Analytical Results for NOSAP Samples
Collected From October 15, 1998 to October 10, 2001

Sample Date	P4 ppm	Sample Date	P4 ppm	Sample Date	P4 ppm
4/4/99A	139	9/1/99A	136	12/3/99-12/8/99A	37
4/4/99B	141	9/1/99B	118	12/3/99-12/8/99B	36
4/5/99A	115	09/04/99	83	12/9/99-12/14/99	19
4/5/99B	90	09/05/99	66	12/15/99-12/20/99A	37
4/6/99A	63	09/06/99	46	12/15/99-12/20/99B	40
4/6/99B	55	09/07/99	35	12/21/99-12/26/99A	41
4/7/99A	46	09/08/99	30	12/21/99-12/26/99B	50
4/7/99B	48	09/09/99	27	12/27/99-1/1/00A	52
4/21/99A	138	09/10/99	44	12/27/99-1/1/00B	34
4/21/99B	174	09/11/99	89	1/2/00-1/7/00A	29
4/28/99A	301	09/12/99	49	1/2/00-1/7/00B	29
4/28/99B	300	09/13/99	39	1/8/00-1/13/00A	70
5/6/99A	283	09/14/99	66	1/8/00-1/13/00B	72
5/6/99B	282	09/15/99	38	1/20/00-1/25/00A	105
5/12/99A	249	09/16/99	77	1/20/00-1/25/00B	97
5/12/99B	263	09/17/99	65	1/25/00-1/31/00A	62
5/19/99A	319	9/4/99-9/9/99	54	1/25/00-1/31/00B	66
5/19/99B	311	9/10/99-9/15/99	51	2/1/00-2/6/00A	114
5/26/99A	96	9/16/99-9/21/99	121	2/1/00-2/6/00B	91
5/26/99B	89	9/22/99-9/25/99	75	2/7/00-2/12/00A	98
6/2/99A	141	9/28/99-10/3/99A	62	2/7/00-2/12/00B	107
6/2/99B	126	9/28/99-10/3/99B	49	2/13/00-2/18/00A	66
6/9/99A	148	10/4/99-10/9/99A	68	2/13/00-2/18/00B	75
6/9/99B	143	10/4/99-10/9/99B	64	2/19/00-2/24/00A	181
6/23/99A	101	10/10/99-10/15/99A	113	2/19/00-2/24/00B	190
6/23/99B	115	10/10/99-10/15/99B	94	2/25/00-3/1/00A	137
6/30/99A	256	10/16/99-10/21/99A	130	2/25/00-3/1/00B	132
6/30/99B	228	10/16/99-10/21/99B	120	3/2/00-3/7/00A	105
7/9/99A	206	10/22/99-10/27/99A	94	3/2/00-3/7/00B	93
7/9/99B	203	10/22/99-10/27/99B	89	3/8/00-3/13/00A	144
7/15/99A	42	10/28/99-11/2/99A	138	3/8/00-3/13/00B	122
7/15/99B	47	10/28/99-11/2/99B	125	3/14/00-3/19/00A	113
7/22/99A	34	11/3/99-11/8/99A	90	3/14/00-3/19/00B	113
7/22/99B	35	11/3/99-11/8/99B	109	3/20/00-3/25/00A	132
7/29/99A	94	11/9/99-11/14/99A	29	3/20/00-3/25/00B	125
7/29/99B	116	11/9/99-11/14/99B	30	3/26/00-3/31/00A	149
8/5/99A	38	11/15/99-11/20/99A	22	3/26/00-3/31/00B	142
8/5/99B	33	11/15/99-11/20/99B	18	4/1/00-4/6/00A	166
8/19/99A	59	11/21/99-11/26/99A	29	4/1/00-4/6/00B	152
8/19/99B	61	11/21/99-11/26/99B	19	4/7/00-4/12/00A	135
8/25/99A	14	11/27/99-12/2/99A	23	4/7/00-4/12/00B	125
8/25/99B	18	11/27/99-12/2/99B	24	4/13/00-4/18/00A	78

Attachment 1.
Analytical Results for NOSAP Samples
Collected From October 15, 1998 to October 10, 2001

Sample Date	P4 ppm
4/13/00-4/18/00B	77
4/19/00-4/24/00A	180
4/19/00-4/24/00B	179
4/25/00-4/30/00A	76
4/25/00-4/30/00B	71
5/1/00-5/6/00A	101
5/1/00-5/6/00B	88
5/7/00-5/12/00A	174
5/7/00-5/12/00B	188
5/13/00-5/18/00A	126
5/13/00-5/18/00B	98
5/19/00-5/24/00A	87
5/19/00-5/24/00B	101
5/25/00-5/30/00A	69
5/25/00-5/30/00B	61
5/31/00-6/5/00A	86
5/31/00-6/5/00B	78
6/6/00-6/11/00A	73
6/6/00-6/11/00B	61
6/12/00-6/17/00A	77
6/12/00-6/17/00B	86
6/18/00-6/23/00A	67
6/18/00-6/23/00B	53
6/24/00-6/29/00A	116
6/24/00-6/29/00B	107
6/30/00-7/5/00A	105
6/30/00-7/5/00B	94
7/6/00-7/11/00A	86
7/6/00-7/11/00B	88
7/12/00-7/17/00A	31
7/12/00-7/17/00B	33
7/18/00-7/23/00A	87
7/18/00-7/23/00B	88
7/24/00-7/29/00A	75
7/24/00-7/29/00B	80
7/30/00-8/4/00A	100
7/30/00-8/4/00B	83
8/5/00-8/9/00A	161
8/5/00-8/9/00B	162
8/11/00-8/16/00A	95
8/11/00-8/16/00B	101
8/17/00-8/22/00A	81

Sample Date	P4 ppm
8/17/00-8/22/00B	85
8/28/00-9/2/00A	7
8/28/00-9/2/00B	7
9/3/00-9/8/00A	15
9/3/00-9/8/00B	13
9/9/00-9/14/00A	21
9/9/00-9/14/00B	17
9/15/00-9/20/00A	4
9/15/00-9/20/00B	4
9/21/00-9/26/00A	33
9/21/00-9/26/00B	31
9/27/00-10/2/00A	153
9/27/00-10/2/00B	168
10/3/00-10/8/00A	90
10/3/00-10/8/00B	100
10/9/00-10/14/00A	35
10/9/00-10/14/00B	36
10/15/00-10/20/00A	59
10/15/00-10/20/00B	67
10/21/00-10/26/00A	41
10/21/00-10/26/00B	47
10/27/00-11/1/00A	161
10/27/00-11/1/00B	168
11/2/00-11/7/00A	56
11/2/00-11/7/00B	61
11/8/00-11/13/00A	32
11/8/00-11/13/00B	37
11/14/00-11/19/00A	2017
11/14/00-11/19/00B	1949
11/20/00-11/25/00A	58
11/20/00-11/25/00B	62
11/26/00-12/1/00A	43
11/26/00-12/1/00B	43
12/2/00-12/7/00A	26
12/2/00-12/7/00B	30
12/8/00-12/13/00A	70
12/8/00-12/13/00B	76
12/14/00-12/19/00A	61
12/14/00-12/19/00B	65
12/20/00-12/25/00A	125
12/20/00-12/25/00B	126
12/26/00-12/31/00A	65

Sample Date	P4 ppm
12/26/00-12/31/00B	60
1/1/01-1/6/01A	62
1/1/01-1/6/01B	84
1/7/01-1/12/01A	204
1/7/01-1/12/01B	198
1/13/01-1/18/01A	100
1/13/01-1/18/01B	94
1/19/01-1/24/01A	210
1/19/01-1/24/01B	215
1/25/01-1/30/01A	183
1/25/01-1/30/01B	186
1/31/01-2/5/01A	170
1/31/01-2/5/01B	159
2/6/01-2/11/01A	104
2/6/01-2/11/01B	105
2/12/01-2/17/01A	95
2/12/01-2/17/01B	107
2/18/01-2/23/01A	103
2/18/01-2/23/01B	95
2/24/01-3/1/01A	104
2/24/01-3/1/01B	120
3/2/01-3/7/01A	108
3/2/01-3/7/01B	109
3/8/01-3/13/01A	40
3/8/01-3/13/01B	36
3/14/01-3/19/01A	71
3/14/01-3/19/01B	80
3/20/01-3/25/01A	32
3/20/01-3/25/01B	29
3/26/01-3/31/01A	20
3/26/01-3/31/01B	25
4/1/01-4/6/01A	380
4/1/01-4/6/01B	359
4/7/01-4/12/01A	125
4/7/01-4/12/01B	102
4/13/01-4/18/01A	188
4/13/01-4/18/01B	182
4/19/01-4/24/01A	83
4/19/01-4/24/01B	87
4/25/01-4/30/01A	63
4/25/01-4/30/01B	67
5/1/01-5/6/01A	157

Attachment 1.
Analytical Results for NOSAP Samples
Collected From October 15, 1998 to October 10, 2001

Sample Date	P4 ppm
5/1/01-5/6/01B	139
5/7/01-5/12/01A	201
5/7/01-5/12/01B	227
5/13/01-5/18/01A	121
5/13/01-5/18/01B	122
5/19/01-5/24/01A	116
5/19/01-5/24/01B	150
5/25/01-5/30/01A	131
5/25/01-5/30/01B	210
5/31/01-6/5/01A	176
5/31/01-6/5/01B	172
6/6/01-6/11/01A	202
6/6/01-6/11/01B	205
6/12/01-6/17/01A	300
6/12/01-6/17/01B	239
6/18/01-6/23/01A	47
6/18/01-6/23/01B	52
6/24/01-6/30/01A	33

Sample Date	P4 ppm
6/24/01-6/30/01B	37
7/1/01-7/6/01A	93
7/1/01-7/6/01B	118
7/7/01-7/12/01A	127
7/7/01-7/12/01B	122
7/14/01-7/17/01A	151
7/14/01-7/17/01B	139
7/19/01-7/24/01A	48
7/19/01-7/24/01B	52
7/25/01-7/30/01A	28
7/25/01-7/30/01B	29
7/31/01-8/5/01A	26
7/31/01-8/5/01B	29
8/6/01-8/11/01A	43
8/6/01-8/11/01B	41
8/12/01-8/17/01A	28
8/12/01-8/17/01B	30
8/18/01-8/23/01A	338

Sample Date	P4 ppm
8/18/01-8/23/01B	330
8/24/01-8/29/01A	148
8/24/01-8/29/01B	167
8/30/01-9/4/01A	108
8/30/01-9/4/01B	117
9/5/01-9/10/01A	26
9/5/01-9/10/01B	25
9/11/01-9/16/01A	196
9/11/01-9/16/01B	241
9/17/01-9/22/01A	206
9/17/01-9/22/01B	210
9/23/01-9/28/01A	132
9/23/01-9/28/01B	113
9/29/01-10/04/01A	10
9/29/01-10/04/01B	12
10/5/01-10/10/01A	44
10/5/01-10/10/01B	45

Average:	137
Standard Deviation:	171
Maximum:	2,017
Minimum:	4

Note: Analyses were performed on daily NOSAP samples from October 15, 1988 through September 17, 1999 and on 6-day composite samples from September 4, 1999 to present. All sample results were given equal weight in the above statistics.

Attachment 2
Summary of Tank V-3700 WAP Sampling Results

Analyte	Analytical Method	Sampling Date			
		09/22/98	07/08/99	07/11/00	06/14/01
Antimony	SW-846 6010B	1.78	1.87	7.21	U
Arsenic	SW-846 6010B	0.379	0.84	1.98	U
Barium	SW-846 6010B	0.020 J	0.082	0.00990J	U
Beryllium	SW-846 6010B	0.0042	0.0015	U	0.0041J
Cadmium	SW-846 6010B	0.587	0.068	0.0444	U
Chromium	SW-846 6010B	0.191	0.203	0.217	U
Lead	SW-846 6010B	0.067 J	0.03	0.0370J	U
Mercury	SW-846 7040A	U	U	U	U
Nickel	SW-846 6010B	U	U	0.0455	U
Selenium	SW-846 6010B	0.057 J	0.08	0.335	U
Silver	SW-846 6010B	0.006 J	U	0.0120J	U
Thallium	SW-846 6010B	U	U	0.0490J	U
Vanadium	SW-846 6010B	0.327	0.251	1.12	NA
Zinc	SW-846 6010B	34.3	88.4	158	NA
Cyanide	SW-846 9010B/90	NA	355	430	NA
Amenable cyanide	SW-846 9010B/90	NA	355	253	NA
Phosphorus - total	EPA 365.3	NA	NA	NA	1370
pH	SW-846 9040B	NA	11.7	12.61	11.09
Ignitability (degrees F)	SW-846 1010	>146	NA	NA	NA

Notes:

Units are mg/L unless noted otherwise

TCLP extraction for metals by SW-846 1311

U = Not detected

J = Estimated

NA = Not analyzed

Attachment 3
Summary of Pond 17 Decant WAP Sampling Results

Analytes	Analytical Method	Sample Date		
		07/07/99	07/12/00	06/15/01
Antimony	SW-846 6010B	1.48	7.67	1.99
Arsenic	SW-846 6010B	0.76	2.09	2.17
Barium	SW-846 6010B	0.054	0.0150J	0.062
Beryllium	SW-846 6010B	U	U	0.00072
Cadmium	SW-846 6010B	0.031	0.125	0.144
Chromium	SW-846 6010B	0.283	0.228	U
Lead	SW-846 6010B	0.03	0.0570J	U
Mercury	SW-846 7040A	U	U	U
Nickel	SW-846 6010B	U	0.0348	0.030J
Selenium	SW-846 6010B	0.14	0.315	U
Silver	SW-846 6010B	U	0.102	0.0753
Thallium	SW-846 6010B	U	0.0400J	U
Vanadium	SW-846 6010B	NA	1.12	NA
Zinc	SW-846 6010B	NA	170	NA
Cyanide	SW-846 9010B/9012A	316	465	26
Amenable cyanide	SW-846 9010B/9012A	306	459	20
Phosphorus - total	EPA 365.3	NA	NA	3,250
pH	SW-846 9040B	11.8	12.43	10.72

Notes:

Units are mg/L unless noted otherwise
TCLP extraction for metals by SW-846 1311
U = Not detected
J = Estimated
NA = Not analyzed

Attachment 4
Summary of Pond 17 Decant Non-WAP Sampling Results

Analytes	Analytical Method	Total	Dissolved
Aluminum	EPA 200.7	2.9	NA
Antimony	EPA 200.7	2.7	2.15
Arsenic	EPA 200.7	2.4	2.05
Barium	EPA 200.7	0.15	0.16
Beryllium	EPA 200.7	U	U
Cadmium	EPA 200.7	1	0.042
Calcium	EPA 200.7	284	NA
Chromium	EPA 200.7	0.44	0.35
Cobalt	EPA 200.7	U	U
Copper	EPA 200.7	0.69	0.66
Iron	EPA 200.7	61.5	NA
Lead	EPA 200.7	0.14	U
Magnesium	EPA 200.7	8.85	NA
Mercury	EPA 245.1	U	U
Nickel	EPA 200.7	U	U
Potassium	EPA 200.7	35,960	NA
Selenium	EPA 200.7	0.05	U
Silica	EPA 200.7	3.1	NA
Silver	EPA 200.7	0.07	0.08
Sodium	EPA 200.7	6,601	NA
Thallium	EPA 200.7	U	U
Vanadium	EPA 200.7	0.2	0.17
Zinc	EPA 200.7	330	114.6
Cyanide	SW-846 9010B/9012A*	460	NA
Phosphorus - total	EPA 365.3	4,113	NA
pH	EPA 150.1	11	NA
Alkalinity, Total	EPA 310.1	25,116	NA
Alkalinity, Bicarbonate	EPA 310.1	20,341	NA
Alkalinity, Carbonate	EPA 310.1	4,775	NA
Ammonia	EPA 350.1	3	NA
Chloride	EPA 300.0	3,125	NA
Fluoride	EPA 300.0	4,858	NA
Nitrate, N	EPA 300.0	6	NA
Sulfide: SO2	EPA 200.7	876	NA
Total Sulfur: SO4	EPA 200.7	3,041	NA
Ortho Phosphorus: P	EPA 365.2	1,988	NA
Conductivity us/cm	EPA 365.2	71,800	NA
Turbidity, NTU	EPA 180.1	68	NA
Total Disolved Solids	EPA 160.1	89,270	NA
Total Suspended Solids	EPA 160.2	932	NA

Notes:

Units are mg/L unless noted otherwise

The sample for the above results was collected on 09/29/01 and analyzed in Astaris's on-site laboratory.

* = Astaris proprietary method equivalent to SW-846 9010B/9012A was used.

U = Not detected

NA = Not analyzed

Attachment 5

SMOKE GENERATION TEST

A. Objective

One of the goals of any waste treatment process for phossy wastes is to end up with material that can be classified as "non-smoking" even in a completely dry state in a landfill. No correlation between elemental phosphorus content and potential P_2O_5 emissions from unreacted phosphorus in the treated material was known to exist. It was important to get a handle on this correlation to meet future environmental regulations and to minimize the cost of any waste treatment where feasible to do so. A test was set up using treated waste slurry samples from the pilot operation to develop a correlation between phosphorus concentration and visible P_2O_5 emissions.

B. Experimental

A hot plate was tuned to the selected temperature by placing a thermometer flat on the heated surface and covering it with some nodule dust for insulation. The temperatures selected for this experiment were approximately 50°C, 80°C, and 95°C. Treated waste slurry with phosphorus concentrations of 100, 240, 500, 1040, 1500, 1700, and 4000 ppm were obtained from retained sample storage.

The samples of treated waste slurry were mixed by shaking to a homogeneous mixture. A small aliquot of the sample was placed on the hot plate in a thin layer about 1-2 square inches in area. As the samples dried out the emission of P2O5 smoke was observed for against a black background by looking horizontally across the surface of the hot plate.

C. Results

The results obtained from this experiment are shown in the following table.

Smoke Generation Test
P_4 vs. P_2O_5 Smoke

	Smoke Observed?		
ppm P_4	94°C	80°C	50-60°C
100	yes	no	no
240	yes	no	no
500	yes	yes	no
1040	yes	yes	no
1500	-	-	very slight
1700	-	-	very slight
4000	yes	yes	yes

A graphical representation of these results is included on the following page.

D. Conclusions

Even on a hot day when surface temperatures at a landfill are over 100°F, or slightly higher, the "non-smoking" limit for the treated waste can still be conservatively set at 1000 ppm phosphorus on a wet basis. The limit on a dry basis depends on the dewatering method used but could be as high as 2000 ppm phosphorus. **It is recommended that the phosphorus limit in the full scale PWMP plant be set at a maximum of 500 ppm to allow for processing variances.**

This conclusion is consistent with the traditional "rule of thumb" often quoted from past experience at the Pocatello plant that 1000 ppm P_4 content is non-smoking. The conclusion is also consistent with observations made during the operation PWMP pilot plant and associated sampling. Of all the phossy waste that was treated and subsequently dewatered no smoking was observed from the damp cake or any dried cake. Phosphorus levels in the treated waste over the course of the PWMP pilot operation ranged from 10 - 570 ppm.

Attachment 5 (continued)

SMOKE GENERATION TESTS

TREATED PHOSSY WASTE PRODUCTS TESTED ON LAB HOT PLATE
CONCLUSION: 1000 PPM P4 LIMIT APPEARS JUSTIFIED